WHAT IS CLAIMED IS:

1. An analyte sensor comprising:

(a) a first oligonucleotide stem;

(b) a second oligonucleotide stem; and

(c) a receptor site capable of binding said analyte, wherein said receptor site is operatively connected to said first oligonucleotide stem and said second oligonucleotide stem,

wherein said sensor is alterable between a first conformational state substantially impeding charge transfer between said first and second stems and a second conformational state permitting charge transfer between said first and second stems, wherein said sensor switches between said first conformational state and said second conformational state when said analyte binds to said receptor site.

2. The sensor as defined in claim 1, wherein said charge is transferred between said first and second stems through said receptor site in said second conformational state.

3. The sensor as defined in claim 1, wherein said receptor site is removed from a conduction path between said first and second stems in said second conformational state.

4. The sensor as defined in claim 1, wherein said sensor switches from said first conformational state to said second conformational state when said analyte binds to said receptor site.

5. The sensor as defined in claim 1, wherein said sensor switches from said second conformational state to said first conformational state when said analyte binds to said receptor site.

6. The sensor as defined in claim 1, wherein said receptor site is selected from the group consisting of nucleic acids and proteins.

7. The sensor as defined in claim 6, wherein said receptor site comprises a nucleic acid aptamer selected for binding affinity to a target analyte.

8. The sensor as defined in claim 1, wherein said receptor site is capable of binding to analytes which do not ordinarily bind to DNA.

9. The sensor as defined in claim 1, wherein said first and second stems each comprise an ordered sequence of nucleotide base pairs, and wherein said sensor comprises a switch region at the junction between said first and second stems, wherein spacial stacking of said first and second stems is said switch region substantially impedes charge transfer between said first and second stems in said first conformational state.

10. The sensor as defined in claim 9, wherein said switch region comprises unpaired nucleotides in said first conformational state.

11. The sensor as defined in claim 10, wherein said unpaired nucleotides are non-Watson-Crick nucleotides.

12. The sensor as defined in claim 10, wherein the spacial stacking of said first and second stems within said switch region is altered when said sensor switches between said first and second conformational states.

13. The sensor as defined in claim 12, wherein said switch region is located proximate to said receptor site.

14. The sensor as defined in claim 12, wherein switch region comprises said receptor site.

15. The sensor as defined in claim 9, wherein said first and second stems each comprise a multi-stranded DNA helix.

16. The sensor as defined in claim 15, wherein said helix is disrupted in said switch domain in the vicinity of said receptor site in said first conformational state.

17. The sensor as defined in claim 1, further comprising a third oligonucleotide stem comprising said receptor site.

18. The sensor as defined in claim 17, wherein said first, second and third stems are connected together at a three-way junction.

19. The sensor as defined in claim 18, wherein at least one of said first, second and third stems comprises a non-Watson-Crick base pairing in the vicinity of said three-way junction.

20. The sensor as defined in claim 17, further comprising a fourth oligonucleotide stem, wherein said first, second, third and fourth stems are connected together at a four-way junction.

21. The sensor as defined in claim 1, further comprising a charge flow inducer coupled to one of said first and second stems for triggering charge flow in at least one of said first and second stems.

22. The sensor as defined in claim 21, wherein said charge flow inducer comprises an excitable moiety alterable between an unexcited and an excited state.

23. The sensor as defined in claim 22, wherein said moiety is an oxidizing agent in said excited state.

24. The sensor as defined in claim 22, wherein said moiety is a reducing agent in said excited state.

25. The sensor as defined in claim 22, wherein said moiety is selected from the group consisting of anthraquinone and rhodium (III).

26. The sensor as defined in claim 1, further comprising a detector electrically coupled to said first stem for directly measuring said charge transfer.

27. The sensor as defined in claim 26, wherein said detector comprises a conductor.

28. The sensor as defined in claim 26, wherein said detector comprises a semi-conductor chip.

29. The sensor as defined in claim 1, wherein said receptor site binds adenosine analyte.

30. A nanoelectronic chip comprising a plurality of sensors as defined in claim 1.

31. A sensor for detecting first and second analytes comprising:

(a) a first oligonucleotide stem;
(b) a second oligonuleotide stem;
(c) a first receptor site capable of binding said first analyte; and
(c) a second receptor site capable of binding said second analyte,

wherein said first and second receptor sites are operatively connected to said first and second oligonucleotide stems, wherein said sensor is alterable between a first conformational state substantially impeding charge transfer between said first and second stems and a second conformational state permitting charge transfer between said first and second stems, wherein said sensor switches between said first conformational state and said second conformational state when said first analyte binds to said first receptor site and said second analyte concurrently binds to said second receptor site.

32. A method for detecting the presence of an analyte comprising:

(a) providing a sensor as defined in claim 1 having a receptor capable of binding to said analyte;
(b) inducing a charge flow in one of said first and second stems of said sensor; and
(b) detecting any change in charge transfer between said first and second stems upon binding of said analyte to said receptor.

33. The method as defined in claim 32, wherein the step of detecting any change in charge transfer comprises electrically coupling a detector to the other of said first and second stems of said sensor.

34. The method as defined in claim 32, wherein the step of inducing a net charge comprises:

(a) coupling a moiety to said second stem alterable between an unexcited and an excited state; and

(b) exciting said moiety to form an oxidizing agent.

35. The method as defined in claim 34, wherein the step of detecting any change in charge transfer comprises testing for the formation of oxidation products of said sensor.

36. The method as defined in claim 35, wherein said testing comprises:

(a) heating said sensor in the presence of piperidine; and

(b) separating any reaction products of step (a) by gel electrophoresis.

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